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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/728,247	TAYLOR, MICHAEL GEORGE	
	Examiner	Art Unit	
	Christina Y. Leung	2613	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2007 and 23 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45 and 47-63* is/are pending in the application.

4a) Of the above claim(s) *3,5-29 and 32-45* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,30,31 and 47-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4-16-2007*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election of embodiment 1, corresponding to **claims 1, 2, 4, 30, 31, and 47-63** in the reply filed on 23 October 2007 is acknowledged. Because Applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. **Claims 3, 5-29, and 32-45** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected embodiment, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 23 October 2007 (see note above).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 1 and 30** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Okoshi et al.** (US 5,146,359 A) in view of **Reingand et al.** (US 7,110,677 B2).

Regarding **claim 1**, Okoshi et al. disclose a coherent optical detection system receiving an incoming optical signal 10 in an optical communications network (Figures 1-3), the system comprising:

a local oscillator 16 emitting light;

a phase diverse hybrid 11 combining the incoming optical signal and the local oscillator light into a first output 111 and combining the incoming optical signal and the local oscillator light into a second output 112 and wherein the local oscillator does not have to be phase locked to the incoming optical signal (column 3, lines 61-68; column 4, lines 1-8);

wherein the phase relationship between the optical signal and the local oscillator light in the first output is different from 0 degrees and different from 180 degrees compared to the phase relationship between the local oscillator light and the optical signal in the second output and the state of polarization of the optical signal relative to the local oscillator light in the first output is not orthogonal to the state of polarization of the optical signal relative to the local oscillator light in the second output (column 3, lines 61-68; column 4, lines 1-8); and

two photodetectors 121 and 122 communicating with the phase diverse hybrid, wherein the two photodetectors receive optical signals from the two outputs and convert them to electrical signals (column 4, lines 9-12);

whereby the electrical signals are processed to provide a complex representation of the envelope of the electric field of the incoming optical signal or a component of the complex representation of the envelope of the electric field of the incoming optical signal (column 4, lines 13-35).

Okoshi et al. disclose that the phase diverse hybrid 11 combines the incoming optical signal 10 and the local oscillator light into first and second outputs wherein the phase relationship between the first output is different from 0 degrees and different from 180 degrees compared to the second output (column 3, lines 61-68; column 4, lines 1-8). Okoshi et al. do not specifically disclose details of the implementation of the phase diverse hybrid 11 and do not

specifically disclose that the hybrid generates two replicas of the incoming signal and two replicas of the local oscillator light

However, Reingand et al. teach a system that is related to the one described by Okoshi et al. including a phase diverse hybrid for combining an incoming optical signal and a local oscillator signal, wherein the phase relationship between the optical signal and the local oscialltor light in one output is different from 0 degrees and different from 180 degrees compared to the phase relationship between the local oscillator light and the optical signal in another output (Figures 6 and 7a). Reingand et al. further teach that the phase diverse hybrid generates two replicas of the incoming signal and two replicas of the local oscillator light, and combines the first replica of the incoming optical signal and the first replica of the local oscillator light into a first output and combines the second replica of the incoming optical signal and the second replica of the local oscillator light into a.second output (Figure 8a; column 14, lines 51-62).

Regarding claim 1, it would have been obvious to a person of ordinary skill in the art to provide a phase diverse hybrid generating two replicas of the incoming signal and two replicas of the local oscillator light as taught by Reingand et al. in the system disclosed by Okoshi et al. as a way to effectively implement the phase diverse hybrid already disclosed by Okoshi et al.

Regarding **claim 30**, as similarly discussed above with regard to claim 1, Okoshi et al. disclose a method of receiving an incoming optical signal in a coherent optical detection system (Figures 1-3), the method comprising the steps of:

emitting light from a local oscillator 16, the local oscillator not requiring a phase lock with the incoming optical signal;

combining, by a phase diverse hybrid, the incoming optical signal and the local oscillator light into a first output 111;

combining the incoming optical signal and the local oscillator light into a second output, wherein the phase relationship between the optical signal and the local oscillator light in the first output is different from 0 degrees and different from 180 degrees compared to the phase relationship between the local oscillator light and the optical signal in the second output and the state of polarization of the optical signal relative to the local oscillator light in the first output is not orthogonal to the state of polarization of the optical signal relative to the local oscillator light in the second output (column 3, lines 61-68; column 4, lines 1-8);

receiving optical signals from the two outputs by two photodetectors 121 and 122 in communication with the phase diverse hybrid; and

converting the optical signals from the two outputs into electrical signals, the electrical signals being processed to provide a complex representation of the envelope of the electric field of the incoming optical signal or a component of the complex representation of the envelope of the electric field of the incoming optical signal (column 4, lines 13-35).

Okoshi et al. disclose that the phase diverse hybrid 11 combines the incoming optical signal 10 and the local oscillator light into first and second outputs wherein the phase relationship between the first output is different from 0 degrees and different from 180 degrees compared to the second output (column 3, lines 61-68; column 4, lines 1-8). Okoshi et al. do not specifically disclose details of the implementation of the phase diverse hybrid 11 and do not specifically disclose generating two replicas of the incoming signal and two replicas of the local oscillator light by a phase diverse hybrid.

However, Reingand et al. teach a system that is related to the one described by Okoshi et al. including a phase diverse hybrid for combining an incoming optical signal and a local oscillator signal, wherein the phase relationship between the optical signal and the local oscialltor light in one output is different from 0 degrees and different from 180 degrees compared to the phase relationship between the local oscillator light and the optical signal in another output (Figures 6 and 7a). Reingand et al. further teach that the phase diverse hybrid generates two replicas of the incoming signal and two replicas of the local oscillator light, and combines the first replica of the incoming optical signal and the first replica of the local oscillator light into a first output and combines the second replica of the incoming optical signal and the second replica of the local oscillator light into a second output (Figure 8a; column 14, lines 51-62).

Regarding claim 30, it would have been obvious to a person of ordinary skill in the art to provide a phase diverse hybrid generating two replicas of the incoming signal and two replicas of the local oscillator light as taught by Reingand et al. in the system disclosed by Okoshi et al. as a way to effectively implement the phase diverse hybrid already disclosed by Okoshi et al.

5. **Claims 2, 4, 31, 47-49, 53, 54, and 56-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Okoshi et al.** in view of **Reingand et al.** as applied to claims 1 and 30 above, and further in view of **Agazzi et al.** (US 2002/0012152 A1).

Regarding **claims 2, 4, 31, and 56**, Okoshi et al. in view of Reingand et al. describe a system and method as discussed above with regard to claims 1 and 30, including providing a complex representation or component thereof of an incoming optical signal, but they do not specifically disclose A/D converters or a digital signal processor. However, Agazzi et al. teach a

system that is related to the one described by Okoshi et al. in view of Reingand et al. including receiving an optical communications signal. Agazzi et al. further teach digitizing the electrical signal from a photodetector by an A/D converter and a performing a computation on digital values from the A/D converters by a digital signal processor (Figure 1B; page 4, paragraphs [0093]-[0098]). Regarding claims 4 and 56 in particular, Agazzi et al. further teach that the digital signal processor produces an output which is the result of a signal processing operation on a plurality of samples over time of the complex envelope of the electric field of the incoming optical signal (Figure 10A; page 6, paragraphs [0130]-[0131]).

Regarding claims 2, 4, 31, and 56, it would have been obvious to a person of ordinary skill in the art to including A/D converters and a digital signal processor as taught by Agazzi et al. in the system described by Okoshi et al. in view of Reingand et al. in order to effectively and efficiently perform desired computations on the incoming signals and facilitate further signal processing in the system.

Regarding **claims 47 and 57**, in the system described by Okoshi et al. in view of Reingand et al. and Agazzi et al., Okoshi et al. disclose that the processing of the signal includes reversing at least partially the effect of propagation of the signal through an optical fiber transmission system (column 1, lines 48-61; column 2, lines 19-24).

Regarding **claims 48, 49, and 58**, in the system described by Okoshi et al. in view of Reingand et al. and Agazzi et al., Okoshi et al. disclose that the processing of the signal includes reversing at least partially the effect of the chromatic dispersion of the optical fiber transmission system on the optical signal (column 1, lines 48-61; column 2, lines 19-24). Regarding claim 49 in particular, Okoshi et al. further disclose applying to the complex envelope of the incoming

optical signal a convolution with a specified mathematical function, the mathematical function being close to the impulse response of the transfer function corresponding to a chromatic dispersion equal in magnitude and opposite to the chromatic dispersion of the optical fiber transmission system (Figure 3; column 4, lines 36-68; column 4, lines 5, lines 1-68; column 6, lines 1-53).

Regarding **claims 53 and 54**, in the system described by Okoshi et al. in view of Reingand et al. and Agazzi et al., Okoshi et al. disclose that the processing of the signal improves the quality of the incoming optical signal, and applying an algorithm which utilizes parameters that are adjusted to give different signal processing functions, and the values of those parameters are chosen for improving the quality of the recovered signal (Figure 3; column 4, lines 36-68; column 4, lines 5, lines 1-68; column 6, lines 1-53). Agazzi et al. also teach that a digital signal processor may be used to provide signal processing that improves the quality of the incoming optical signal, and regarding claim 54, in particular, Agazzi et al. teach that the signal processing operation that improves the quality of the recovered signal is a feedforward equalization-decision feedback equalization function (page 1, paragraph [0015]). Again, it would have been obvious to a person of ordinary skill in the art to including a digital signal processor including a feedforward equalization-decision feedback equalization function as taught by Agazzi et al. in the system described by Okoshi et al. in view of Reingand et al. and Agazzi et al. in order to effectively and efficiently perform desired computations on the incoming signals and facilitate further signal processing in the system.

6. **Claims 51 and 59** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Okoshi et al.** in view of **Reingand et al.** and **Agazzi et al.** as applied to claims 4 and 56 respectively above, and further in view of **Turpin et al.** (US 2002/0126644 A1).

Regarding **claims 51 and 59**, Okoshi et al. in view of Reingand et al. and Agazzi et al. describe a system as discussed above with regard to claims 4 and 56, including a digital signal processor performing signal processing operations, but they do not specifically disclose partially reversing the effect of multipath interference imposed on the incoming optical signal. However, Turpin et al. teach a system that is related to the one described by Okoshi et al. in view of Reingand et al. and Agazzi et al. including an optical communications system (page 3, paragraph [0047]) and further teach using digital signal processing to partially reverse the effect of multipath interference imposed on an incoming signal (page 4, paragraph [0055]).

Regarding claims 51 and 59, it would have been obvious to a person of ordinary skill in the art to at least partially reverse the effect of multipath interference as taught by Turpin et al. in the system disclosed by Okoshi et al. in view of Reingand et al. and Agazzi et al. in order to enable more efficient reception of the incoming signals and ensure that the information contained in the signals is effectively received.

7. **Claims 52, 55, and 60** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Okoshi et al.** in view of **Reingand et al.** and **Agazzi et al.** as applied to claims 4, 53, and 56 respectively above, and further in view of **Bessios** (US 7,110,683 B2).

Regarding **claims 52, 55, and 60**, Okoshi et al. in view of Reingand et al. and Agazzi et al. describe a system as discussed above with regard to claims 4, 53, and 56 respectively, including a signal processing operation performed by the digital signal processor. They do not

specifically disclose performing an optical filtering function on the complex envelope of the electric field or that the signal processing operation that improves the quality of the recovered signal is a maximum likelihood sequence estimation function.

However, Bessios teaches a system that is related to the one described by Okoshi et al. in view of Reingand et al. and Agazzi et al., including receiving an incoming optical signal. Bessios further teaches performing digital signal processing operations including an optical filtering function on the complex envelope of the electric field of the incoming signal and a maximum likelihood sequence estimation function that improves the quality of the recovered signal (column 3, lines 22-67; column 4, lines 1-8; column 6, lines 63-67; column 7, lines 1-3).

Regarding claims 52, 55, and 60, it would have been obvious to a person of ordinary skill in the art to perform an optical filtering function and maximum likelihood sequence estimation function as taught by Bessios in the system described by Okoshi et al. in view of Reingand et al. and Agazzi et al. in order to advantageously compensate for dispersion effects in optical signals and ensure that the signals are effectively received.

8. **Claim 50** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Okoshi et al.** in view of **Reingand et al.** and **Agazzi et al. '152** (i.e., US 2002/0012152 A1) as applied to claim 47 above, and further in view of **Agazzi '827** (US 2002/0060827 A1).

Regarding **claim 50**, Okoshi et al. in view of Reingand et al. and Agazzi et al. '152 describe a system as discussed above with regard to claim 47, including a signal processing operation performed by the digital signal processor, but they do not specifically disclose that partially reverses the effect of self phase modulation imposed on the incoming optical signal. However, Agazzi '827 teaches a system that is related to the one described by Okoshi et al. in

view of Reingand et al. and Agazzi et al. '152, including performing digital signal processing on a received optical signal (Figure 13). Agazzi '827 further teaches that the signal processing operation performed by the digital signal processor at least partially reverses the effect of self phase modulation imposed on the incoming optical signal (page 1, paragraph [0011]; pages 6-7, paragraphs [0081]-[0087]).

Regarding claim 50, it would have been obvious to a person of ordinary skill in the art to partially reverse the effect of self phase modulation imposed on the incoming optical signal as taught by Agazzi '827 in the system described by Okoshi et al. in view of Reingand et al. and Agazzi et al. '152 in order to further reduce negative nonlinear effects in the optical signal and ensure that the information in the signal is effectively received.

9. **Claims 61-63** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Okoshi et al.** in view of **Reingand et al.** and **Agazzi et al.** as applied to claims 30 and 31 above, and further in view of **Fishman et al.** (US 6,607,311 B1) and **Spickerman et al.** (US 6,281,995 B1).

Regarding **claims 61-63**, Okoshi et al. in view of Reingand et al. and Agazzi et al. describe a system as discussed above with regard to claims 30 and 31. Reingand et al. and Agazzi et al. further suggest a plurality of WDM channels (Reingand et al., Figure 14; Agazzi et al., page 4, paragraphs [0098]-[0102]), but they do not specifically teach compensating for crosstalk imposed on a first of the plurality of WDM channels.

However, Fishman et al. teach a system that is related to the one described by Okoshi et al. in view of Reingand et al. and Agazzi et al., including an optical communication system. Fishman et al. further teach an incoming optical signal comprising a plurality of WDM channels (Figure 2), and generally teach compensating for crosstalk imposed on the plurality of WDM

channels (column 2, lines 18-55). Regarding claims 62 and 63 in particular, Fishman et al. teach that the crosstalk is cross phase modulation imposed on the first WDM channel by a second WDM channel during passage through an optical fiber transmission system or caused by four wave mixing occurring when the plurality of WDM channels generates a four wave mixing product which at least partially overlaps the optical spectrum of the WDM channel that experiences the crosstalk (column 1, lines 38-63).

Regarding claims 61-63, it would have been obvious to a person of ordinary skill in the art to provide a plurality of WDM channels and compensate for crosstalk imposed on the channels as taught by Fishman et al. in order to advantageously provide greater amounts of information on the optical signals while ensuring that the multiple channels are effectively received without distortion.

Further regarding claims 61-63, Okoshi et al. in view of Reingand et al., Agazzi et al., and Fishman et al. do not specifically suggest steps of compensating for crosstalk imposed on a first of the plurality of WDM channels by at least one of the remainder of the plurality of WDM channels; and estimating the information carried on the first of the plurality of WDM channels. However, Spickerman et al. also teach a system that is related to the one described by Okoshi et al. in view of Reingand et al., Agazzi et al., and Fishman et al., including an optical communication system with a plurality of WDM channels (Figure 1). Spickerman et al. further teach compensating for crosstalk imposed on a first of the plurality of WDM channels by at least one of the remainder of the plurality of WDM channels; and estimating the information carried on the first of the plurality of WDM channels (column 1, lines 28-43). Regarding claims 61-63, it would have been obvious to a person of ordinary skill in the art to compensate for crosstalk in

the way taught by Spickerman et al. in the system described by Okoshi et al. in view of Reingand et al., Agazzi et al., and Fishman et al. in order to effectively ensure that the plurality of channels are received without crosstalk and advantageously permit the channels to be more closely spaced together (Spickerman et al., column 1, lines 40-43).

Response to Arguments

10. Applicant's arguments with respect to claims 1, 2, 4, 30, and 31, filed 16 April 2007, have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christina Y Leung
CHRISTINA LEUNG
PRIMARY EXAMINER